

# REFLECTIONS ABOUT THE IMPACTS OF NATURAL AND TECHNOLOGICAL DISASTERS ON EUROPEAN HEALTH SYSTEMS

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## Abstract

The present article aims to analyze the impact of natural and technological disasters in the European Union (EU) and in the European health systems. The strong impact of the economic and financial crisis, which has become more serious in the European countries, has made necessary for the member states to revise their budgets, and with this to rethink their policies of disaster prevention. Their occurrence lead, directly or indirectly, to implications in the health system budgets, given the huge number of people affected and deaths caused by these kinds of events.

Regarding the prevention of two new calamities of modern times, the natural and the technological accidents, it is possible to notice that the action of the European health systems and of the Europeans' Environmental, Health and Consumer Commission, is essentially based on action within the framework of epidemics, pollution related diseases, road accidents and injuries caused by high temperatures. It leaves out floods and storms, which are the ones that most affect the population of the 27 EU member states. These kinds of accidents concern the public health and should be treated as such.

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**Keywords:** Natural and technological disasters, Impact on Heath Systems, European Union

## Introduction

This article contributes to the analysis of natural and technological disasters in the European Union (EU), and its health systems. However, it will not be possible to ignore the current financial and economic crisis. Its strong impact requires the EU the need to revise the member states' budgets and along with this to rethink the disasters mitigation policies. Their occurrence lead, directly or indirectly, to implications in the health systems' budgets, given the huge number of populations affected and deaths caused by these kinds of events. Thus,

the principal EU deficits are found among main areas, such as: the competition; employment growth; democratic participation and political, institutional and economic legitimacy; the decision and action. (Alves, 2008:6). What will be possibly found in the near future, in the 27 EU, is a fragile economy which the recovery will be hindered by the banks' conditions (Hagen e Pissany-Ferry, 2009:21). It will also be possible to see a series of conjunctures, such as: **a)** the unemployment rate in 2010 is 11,9% (Eurostat:2011). This raise, over 10% and even in some regions with 15 to 20%, has no short-term improvement perspective (Eurostat: 2011a; Hagen e Pissany-Ferry, 2009:21); **b)** Industrial production shortage, which the recovery, with enormous costs, will partially be made with the growth of work forces, with more investments and expense in innovation among others (Hagen e Pissany-Ferry, 2009:21); **c)** Public financial deterioration in almost all of the states. Public deficits over 10% of the GDP in many countries (op. cit), such as Greece (10,5%), Ireland (32,4%) and UK (10,4%) (Eurostat: 2011); **d)** In the euro zone, some countries may face difficulties concerning their public expenses funding, having its sustainability being questioned by the markets. Ireland, Greece and Portugal, countries which have been intervened by the IMF, ECB and the EU<sup>i</sup>, are forced to reduce the amount of debt and perform a difficult reduction of fiscal expenses, as a way to put an end to these speculations (Canale, 2011:2,10<sup>42</sup>; Hagen e Pissany-Ferry, 2009:21); **e)** Evidence of the incapability of the euro and of its institution to protect the financial balance of several economies, taking in consideration the previously mentioned countries and even Spain (Amaral, 2010:96).

This situation might lead to an increase in the disagreements between the member states, where some will feel more deeply the crisis than others, and consequently there is a risk of political dissent and of dissents in affected European space's development policies, summing up, a political crisis (Hagen e Pissany-Ferry, 2009:21), which is not foreign to the health and civil defense sectors.

Concerning health, according to the 199<sup>th</sup> of the Maastricht Treaty (EC: 1992) and the 268<sup>th</sup> to the 280<sup>th</sup> Amsterdam's (EC: 1997), the EU has a common budget with which it finances the running of its institutions, organizations, as well as the common policies. Although it does not hold an effective health policy, a part of the budget is destined to

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<sup>42</sup> Failure to fulfill the "Troika" obligations (MIF, ECB e EU), might put the rest of the euro zone members in financial sustainability difficulties. The austerity programs practiced its governments have taken several shapes, from reduction of public servers and wages, privatizing of state companies, health budget cuts, increased VAT tax, remodeling of bank sector, among others (Portuguese Government, 2011:3-35; Greek Government, 2010:25-26; Ireland Government, 2010:17-32).

funding preventive action programs, information and health research (European Commission: 2010a).

Health plays an important part in the economic sustainability of the 27 EU space. The demographic growth resulting from the growth of the elderly population and chronic diseases will have a noticeable effect on the economy, due to the increase in the expenses related to caring for the related population. To the extent that the average life expectancy increased from 70 in 1960 to 79 in 2008.

The people over 65 years nowadays represents 17% of the whole population (OCDE: 2010). Chronic diseases represent 86% of the death causes (EC: 2011). Consider also the effects that medical admissions, specialized medical treatments, operations and reimbursed medicines, which can also be caused by natural and technological disasters, have implications in the budget of the member states and productive fabric of each one of them.

According to Jakab (2009:1), Europe's public health sector is going through a fast change. Inevitably, there are still inequalities in its access, both inside and outside the Union. Together with the demographic development and migrations, they are the major concerns that Europe faces. These changes, associated for example with the 2009 influenza pandemics (H1N1), the increase of not transmissible diseases epidemics, the effects of climatic changes over health, during a crisis time, demand new responses from the public health, in all possible levels.

With evidence of the continuity of climate change in the near future, the framework that is presented to the health systems is a complex one. The increase of disease is impending, not only the infectious kinds, but also the nutritional, breathing and cardiovascular, due to food, water, and groundwater contaminations, as well as air pollution (Howard, et al, 2008:435; Francesco, et al, 2005:1).

On the other hand, the climatic risk stresses the probability of the occurrence of different natural risks, such as floods and extreme temperatures, which by itself comprise multiple risks to human health (EC:2011), as will be seen in chapter 2. The health systems must find ways to respond, in addition, to the tendency of population growth and chronic diseases (due to unhealthy lifestyles), suggesting a change in the health care models. The prevention of these and other diseases must be taken into account, as a mechanism for alleviating the costs in the health sectors.

Taking into account that the member states, although having different organizations, regarding the national health systems, have traditionally emphasized transversal concerns.

Namely the public nature, the universality and social solidarity. It should be noted the small space occupied by the private sector.

Generally the health systems, according to the OECD, face a permanent financial insufficiency; having created complementary ways of funding, without challenging the initial model adopted by each country. In countries with a National Health System model, as will be seen further, there is a progressive separation of the roles of funder, regulator and service provider. The first ones are responsibility of the state and the latter are up to other entities which are hired. (Portuguese health Ministry, 2007:3).

The European health systems have spread and developed over the centuries in the light of two grand models: some associated to Bismarck's, originated in the 19<sup>th</sup> century; and others to Beveridge's, originated in the 20<sup>th</sup> century (Barros e Gomes, 2002:4 e Giovanella, 2006:3), in the last chapter the relation between these models and disasters will be analyzed.

Both rely on the principle that the access to healthcare cannot depend on the capability of the citizens to pay. But only in the need of every one (Portuguese health Ministry, 2007:20). The considerations presented in this introduction will be further developed. This article will be divided in two chapters with some points. The first one is about the health systems in EU and the second presents an analysis to the natural and technological disasters in the EU.

### **Beveridge and Bismarck funding health systems**

#### **Funding sources**

In the EU 27 health systems the principal resources come from: taxes, social security scheme contributions, voluntary subscriptions of private security and user's direct payment. (Barros e Gomes, 2002:4). In table 1 below, it is possible to visualize the means of funding of each state and find that the majority adopts the model based in social security.

**Table 1:** Distribution of the European Systems of Health by Funding Models

| <b>Member-State</b>   | <b>Predominant System</b>   | <b>Main Supplementary System</b>                             |
|---|---|--|
| Cyprus, Finland, Greece, Italy, Ireland, Malta, Spain, Sweden, UK   | Beveridge Model (public:taxion)                                   | Private voluntary insurance, direct payment                  |
| Denmark, Portugal   | Beveridge Model   | Direct payment   |
| Austria, Belgium, Bulgaria, Czech Rep., Estonia, France, Germany, Hungary, Latvia, Lithuania, Luxembourg, Romania, Slovenia | Bismarck Model (public: compulsory social insurance)              | Private voluntary insurance, Direct payment, public taxation |
| Poland, Slovakia  | Bismarck Model  | Direct payment, public taxation                              |
| Netherlands   | Mixed compulsory social insurance and private voluntary insurance | Direct payment, public taxation                              |

Source: **Hugh, W. et al, 2008: 478-48; OECD: 2011b**

Among the systems' structural characteristics, it is possible to notice that the main modalities of funding are conditioned by the social protection models. Beveridge's model is based health social security, funded by the contributions of workers and employers. The state has no direct intervention in medical assistance, as they transfer this responsibility to the public security companies.

Regarding the Bismarck model, it is based on national health services, which are funded with tax resources. In countries that follow this model, access to health is universal, with no need of direct contributions from the citizen, which would have been paid previously (Giovanella, 2006:3).

However, according to Barros and Gomes (2002:4), although the European health systems depend on a miscellaneous of these funding lines, there are countries that are found in a stage of transition from one model to another. Med et al (2009:17-18) also refer that although each country developed their own funding mechanism, they all share similar objectives. They all depend on a miscellaneous of funding sources, yet, most of them are controlled directly or indirectly by the state. Only a small percentage comes from taxes directed to the services. In addition to the main models, there is also the private one, based on voluntary security, acting in a supplementary way. This is the case of most countries which the systems are based in social security. It is worth noticing the Netherlands, with a system predominately mixed, based on social security and private sector voluntary security.

### **The systems currently**

Nowadays, there is the common concern of the Union countries to provide a large coverage of the health system at high quality and equality levels, with financial viability. (Portuguese Health Ministry, 2007: 20). It is worth noticing that health plays an important part in all sector of society life. This importance being corroborated by the inclusion of health protection in the Lisbon Treaty in many different realms, from employment to education, the environment, among others (EC: 2007a).

It is also known that these systems comprise a series of public and private institutions, their mission being the improvement, maintenance or reestablishment of the citizens' health, considering justice and social participation, as well as responding to individual and social needs of the citizens and their capacity to deal with crisis. However, in this article we are focusing on the public ones.

On the other hand, the demand for health services is increasing inasmuch as the European population is aging, demanding more and better access to health. It is estimated that in 40 years, the 65 years old or over people will represent 40% of the European population.

Aging is not the only cause of the demand. The new lifestyles, the increasing number of diseases caused by risk factors, are also of concern. Considering the availability of services, this situation leads to an increase in costs for the providing of the services, due to competition (Altsitsiadis et al, 2009: 42).

At the same time, in the recent years, this region has faced a series of catastrophes, natural and technological, imposing a risk to the citizens' health and security. Floods, forest fires, earthquakes, nuclear accidents, among others, have come, as we are going to see in chapter 2, to infect more than 11.000.000 people. These numbers tend to increase, given the climate changes that have recently occurred. They have an enormous implication on the public health and for the financial sustainability of the health systems. (WHO-Europe, 2007: 8-9). The anthropic occupation, with constructions on steep slopes, on unstable soils, on flooding riverbeds and the unsustainable expansion of megacities, in zones prone to natural disasters (UNESCO, 2007: 7), are some other aspects that resulting from crisis will set the security of the people and of the systems on a critical point.

In 2008, the total amount of health expenses in the EU was 76,5% (percentage of whole expenses). Sweden, Denmark and Czech Republic can be highlighted, being evident the strong investment that their governments made in this area, despite their different funding models (see Table 1 on pp.5). It can also be seen that there is a balance among the state member which systems are based on taxes and the ones based on social security, with 70,6% and 74,6% respectively (OECD Health Data: 2011b).

### **The treatment given to the health systems by the EU Treaties**

The Coal and Steel Treaty (1951), in its 69<sup>th</sup> article (EC: 2010b), cites health, when approaching the compromise that the states should establish when defining labor matters. It considers that recruiting should privilege proven qualification and not nationality. With no loss of limitations imposed by fundamental health and public related needs.

Likewise, the Euratom Treaty (1957), in its 96<sup>th</sup> and 195<sup>th</sup> articles (EC: 2010c:40), on the one hand reformulates the article of the prior Treaty, and on the other hand stresses that the Community's institutions, agencies and common companies should consider (from the Treaty commencement) whenever related to the conditions of access to raw materials, the adopted national regulations, due to public order or public health reasons.

Although the concerns with health have been present in the Treaties since the beginning of the European construction, it was only in the Maastricht Treaty (European Communities, 1992:35) that a real public health strategy could be developed. Specific action programs were adopted, concerning areas such as cancer, Aids, substance abuse, health

promotion and vigilance. Some other projects were proposed, such as rare diseases, injury prevention, and pollution related diseases. At the same time reports about the health of the European Community were initiated, together with recommendations about safety related to blood products (EC: 2010a).

Regarding the Lisbon Treaty, health is cited in articles related to domestic market, the environment, consumer protection, social policies, development policies, research, among others (EC, 2007a:2). According to the 168<sup>th</sup> article of the Functioning Treaty, included in the Lisbon Treaty (EC, 2008a:123-124), policies related to health, organization and healthcare providing, as well as medical care, are left to the state members. The commission's role is thus confined to complement these actions. Apart from that, it has a predominant impact in the improvement of the common public health and in the prevention of human diseases and conditions, as well as in the reduction of health hazard causes.

This action comprises prevention, research, education and information mechanisms, in addition to some others that must be articulated by the states, which will coordinate their policies among themselves; in accordance with the European Commission. On the other hand, it will support and encourage their actions, being able to establish quality and security standards in specific realms, such as human origin substances and organs, blood and its derivatives. Summing up, certain realms will not be able to work effectively alone, becoming essentially a Community approach.

Among these realms, according to the Commission (2007:2), are the major health threats such as pandemics, bioterrorism and the negative consequences related to the free circulation of products, people and services. The acting also comprises the funding of actions on behalf of the states' health, through programs and networks, such as: "Community Health Program", "Progress", "Framework Programs for Research", "Closing the Gap", "Determine", "Eurothine", "Roma-Health", "European Network for Workplace Health Promotion"(EC: 2010a).

The strong political and economic bias that promoted the birth of the current EU, due to the need of Europe to reconstruct the post-WW2 economy, is clearly evident in all the Treaties. They seem to relegate the health sector to a second plan, despite the relevance given and the steps taken in their promotion. The separation of this sector from the others in the Community policies (maintaining its integration) and its constitution in a singular one, which already is by itself a political and economic important aspect that must be seen as a financial investment for the future of Europe, for the reasons which have been approached in the article. Also for the need to enlarge and promote the sharing of the virtues of solidarity and

equality, which are believed to be the funder ideas of this organization. There should be an investment in the European health system.

### Natural and technological catastrophes in Europe

#### Brief comparative analysis between the decades of 1990-2000 and 2000-2010

Ulrick Beck, in “Risk Society” (1992:55), considers that the industrial society was replaced by the risk society, thus, our society. In it the risk distribution no longer matches the social, economic and geographical inequalities of the first modernity. They come from the uncertainty produced by the social development, from science, technology and not so much from the chance of natural dangers. After a catastrophe, the interaction between vulnerability and occurrence risks might result in substantial injury and human loss. A large number of victims may overload the health systems and cause disturbances to its proper functioning (JHSPH,s/d). This way, the natural and technological risks challenge Europe’s sustainable and balanced development. The cities, regions and citizens are increasingly exposed to distinct risk conditions. (Peltonen, 2006: 154).

Notice, by now, an analysis between the decades of 1990-2000 and 2000-2010.

On the first decade, storms are stressed as 78% of the member states face them. Being the most frequent disaster that happened during this period, it was the one which most affected the populations (5.850.703). After them are the floods (63%) and diverse kinds of accidents (89%). In the decade between 2000-2010, extreme temperatures are stressed, as 81% of countries are affected. Notice that in table 2 (pp. 9), the increase number of states from one period to the other. In the previous decade they were only 37%. This shows the importance that climate change has had during the years.

**Table 2:** % of Member-States affected by Natural and Technological Disasters: 1990-2000 and 2000-2010

| Disasters                            | %   | 1990-2000   | %   | 2000-2010   |
|--------------------------------------|-----|---|-----|---|
|                                      |     | Member-State  |     | Member-State  |
| <i>Mass Movement</i>                 | 26% | At, Fr, De, It, Pt, Ro, Es  | 7%  | At, It  |
| <i>Storms</i>                        | 78% | At, Be, Bg, Dk, Fi, Fr, De, El, Hu, Ie, It, Lv, Lt, Lu, NI, Po, Pt, Ro, Es, Se, Uk              | 85% | At, Be, Bg, Czech Rep, Dk, Ee, Fr, De, El, Hu, Ie, It, Lv, Lt, NI, Po, Pt, Ro, Sk, Si, Es, Se, Uk |
| <i>Extreme Temperature</i>           | 37% | Bg, Fr, De, El, It, Lt, Po, Ro, Es, Uk  | 81% | At, Be, Bg, Czech Rep, Ee, Fr, De, El, Hu, It, Lv, Lt, Lu, NI, Po, Pt, Ro, Sk, Si, Es, Se, Uk     |
| <i>Floods</i>                        | 63% | At, Be, Bg, Cz, Fr, El, Hu, Ie, It, Lu, NI, Po, Pt, Ro, Sk, Es, Uk                              | 70% | At, Be, Bg, Czech Rep, Fi, Fr, De, El, Hu, It, Ie, Lt, Po, Pt, Ro, Sk, Si, Es Uk                  |
| <i>Earthquake (seismic activity)</i> | 44% | At, Be, Bg, De, El, It, NI, Pt, Ro, Si, Es, Uk  | 26% | Bg, De, El, It, Ro, Si, Uk  |
| <i>Drought</i>                       | 30% | Dk, Fr, El, Hu, It, Lt, Pt, Es  | 22% | Bu, Hu, It, Lt, Pt, Ro  |
| <i>Epidemics</i>                     | 15% | Fr, NI, Ro, Es  | 33% | Fr, De, Ie, It, Lv, Ro, Es, Se, Uk  |
| <i>Wildfire</i>                      | 22% | Fr, El, It, Po, Pt, Es  | 26% | Bg, Fr, El, It, Pt, Sk, Es  |
| <i>Technological Accidents</i>       | 89% | At, Be, Bg, Cz., Dk, Ee, Fi, Fr, De, El, Hu, It, Ie, Lt, Mt, NI, Po, Pt, Ro, Sk, Si, Es, Se, Uk | 85% | At, Be, Bg, Cz, Dk, Ee, Fi, Fr, De, El, Hu, It, Lt, Lu, Mt, NI, Po, Pt, Ro, Sk, Si, Es, Uk        |

Source: EM-DAT: The OFDA/CRED: 2011



**Legend:** Austria: At, Belgium: Be, Bulgaria: Bg, Czech Rep: Cz, Denmark: Dk, Estonia: Ee, Finland: Fi, France: Fr, Germany: De, Greece: El, Hungary: Hu, Italy: It, Ireland: Ie, Latvia: Lv, Lithuania: Lt, Luxembourg: Lu, Malta: Mt, Netherland: Nl, Poland: Pl, Portugal: Pt, Romania: Ro, Slovakia: Sk, Slovenia: Si, Spain: Es, Sweden: Se, United Kingdom: Uk

However, it is not only the nature's risk that has changed, but also the context in which they have come to manifest and the society's capacity to deal with them. The power that cause these changes are, among others, urban population density, and the concentration of economic activity in certain regions which are expanding, making this areas more vulnerable (OCDE, 2003:2-6).

As in 1990-2000, most countries have also developed storms (85%), floods and accidents related to the technological realm (85%). The number of countries affected by the first two disasters cited increased. Floods represent the disaster that has most affected the EU population, 1.280.512 citizens.

Mostly, the number of countries suffering from catastrophes increased from 1990-2000 to 2000-2010, specially being affected by extreme temperatures (44%), epidemics (18%), storms (7%), floods (7%), and fire (4%). Despite the likely implications of climatic change, according to Douglas (1985) and Slovic (2002:317-319,184; 1989: 280-285), the different protagonists' social role in a risk situation determines the different ways of understating and acting during it. The public tends to be subjective hypothetical, irrational and even emotional. At the same time that the risk managing organization specialists are objective, analytical and rational.

### **Mass movements**

Looking into the various kinds of disasters in more detail, notice (see Table 2 in pp. 9) from one decade to another, there was a decrease of states (from 26% to 7%) with *mass movements*. Only Austria and Italy still suffered from this kind of event. The decrease of snow avalanches in regions near the alps contributed much for this, as in Montroc (France) and in Upper Bavaria (Germany); as well as the landslide in the Azores (Portugal), Romania and the Pyrenees (Spain) (CRED:2011). This lead the countries which comprise Baveridgean bases to have been more affected from 1990-2000 than the ones with Bismarckian and mixed bases. See below Table 3.

**Table 3:** No. Affected in the Types of Disasters by Health Financing Model, and overall cost of damage: 1990-2000 and 2000-2010

|  | <b>Beveridge</b> |                  | <b>Bismarck</b>  |                  | <b>Mixed</b>     |                  |
|--|------------------|------------------|------------------|------------------|------------------|------------------|
|  | <b>1990-2000</b> | <b>2000-2010</b> | <b>1990-2000</b> | <b>2000-2010</b> | <b>1990-2000</b> | <b>2000-2010</b> |
| <i>Mass Movement</i>   | 3966             | 159              | 330              | 281              |                  |                  |
| <i>Storms</i>  | 1266926          | 23988            | 4333677          | 113482           | 250100           | 1                |
| <i>Extreme temperatures</i>                                  |                  | 336              | 12491            | 2014             |                  | 1965             |
| <i>Floods</i>  | 33180            | 464206           | 884900           | 816306           | 15000            |                  |
| <i>Earthquake (seismic activity)</i>                         | 190622           | 75100            | 8775             | 677              | 20               |                  |
| <i>Droughts</i>  | 6000000          |                  |                  |                  |                  |                  |
| <i>Epidemics</i>   | 1383             | 12511            | 5270             | 712              | 200              |                  |
| <i>Wildfire</i>  | 19734            | 157982           | 1265             | 3180             |                  |                  |
| <i>Technological Accidents</i>                               | 53307            | 3235             | 6584             | 19726            | 50               | 3195             |
| <b>Total of Affected</b>                                     | 7515811          | 734282           | 5246708          | 936652           | 265370           | 5161             |
| <b>Damage costs in millions of dollars (included deaths)</b> |                  |                  |                  |                  |                  |                  |
| <b>Total</b>   | 2.727.972        | 12.008.301       | 3.581.813        | 51.432           | 35.427           | 1.314            |

Source: EM-DAT: OFCA/CRED: 2011

However, this risk does not belong exclusively to the Alps (JRC-EC: 2011). Many times they are associated to floods. Heavy rain, soil erosion and degradation, usually landslide triggers, with the increase of precipitations due to climate change (Rhyner and Linser, 2010:82), might have led to a landslide in the cited regions.

#### 2.1.2. Storms:

Climate change has caused an increase of heavy winter *storms* all around Europe (Pamela, et al, 2006:2). If from the first decade to the second only Finland and Luxemburg had not been subdued by storms, Czech Republic, Estonia, Slovakia and Slovenia suffered from it for the first time, during the most recent period. They have gathered to most countries due to the occurrence of phenomena triggered by storms: the extratropical cyclones (Wehrli, Sauri and Herkendell, 2010: 33:34). They have caused destruction especially in central and east Europe, examples are: Erwin, Krill and Emma (CRED: 2011). Notice that the countries in this region are generally Bismarckian, and storms have considerably affected more people than in the other countries.

#### Extreme temperatures

*Extreme temperatures* mostly happened in 2000-2010. A substantive number of countries suffered from them. The exceptions are Denmark, Finland, Ireland and Malta,

which have better responded to these disasters, in both decades. Notice that all of them are included in the Beveridge category. This model according to table 3 (pp. 11), presents the best results in the two phases that have been analyzed. No population of its states is affected and only 59 citizens died from 1990-2000. However, from 2000-2010, the numbers are the opposite, especially regarding the number of deaths (38.356) which happened during the 2003 heat waves, affecting Italy, Spain and similarly France, as will be further exposed (CRED:2011).

Notice that none of the countries which suffered from this kind of disaster in 1990-2000 were able to lessen it in the next period, either belonging to Bismarckian, Baveridgian or a mixed model. This is due to the fact that the European population is exposed to climate change which led to a strong impact in health. (Wehrli, et al, 2010:42). The deaths in all EU increased from 543 to 73.921, constituting doubtlessly the risk that caused more deaths in the last few years. France, for instance, shows the highest number in the Union (20.893) (CRED: 2011).

According to Poumadère, et al (2005: 1484-1485, 1486, 1490-1492), socioeconomic factors such as poverty and isolation, associated to age and disease reinforce this data. The government quickly introduced the *Canicule* plan, which aims to prevention, given the disturbances that arose in the health system that was not able to repost effectively. This event has been seen since then as an unequivocal danger, which by then was denied by the French context. The perception of the risk, that is based on personal belief, loving ones, and experience, independently of their validity, has changed (Renn,2005: 19; Aven and Renn, 2009:6-9).

### **Floods**

Although there is strong evidence of the anthropogenic climate change in Europe, it is not conclusive that climate tendencies have influence on hydrologic *floods* at a continental level in Europe (Barredo and Sauri, 2010: 65, 65). Nevertheless, they are attributed to the increase of flash floods in many European regions: due to the increment of heavy rain caused by them (APFM, 2007: 60). They are many times triggered by heavy storms, tropical cyclones and tornados (Grasso, 2009: 23). The population density and the anthropic occupation level on riverbanks are other causes of its occurrence (APFM: 2011).

The quantity of inundation continues to constantly increase in the last two decades, being possibly deadly when they happen without previous notice. (Grasso, 2009: 23). It was seen that most countries kept experiencing these events in 2000-2010, the same way it happened with storms. The exceptions are Luxemburg and the Netherlands. The latter, having

a mixed funding health system. The fact of having 27% of its territory under sea level (in Zuidplaspolder), was of extreme importance to the managing of water resources, with the draining of the lands and the creation of local association that perform this task. The major technical and political sensibility for this kind of risk was likewise determinant (Rocha, 1998:13).

However, other countries have parts of their lands under sea level, such as Denmark, Sweden, UK, Germany, France and Poland<sup>43</sup> (Geology: 2011). From these, only the two first, in the last twenty years, have not been affected. Comparatively, the remaining show very high numbers of affected people in the two last decades.

Notice, for example, that in Sweden, in addition to the strong mitigating plans towards climate change, the risk managing of the cities, largely considers the flooding risks. A major part of its mitigation strategy is the creation of maps to all the provinces (Thorsteinsson, et al: 2005:385). Notice that before the 2007/60/C Directive (EC: 2007e) demanded it, the insurance companies that considerably cover the country make high pressure towards the municipalities to develop these maps (op. cit.).

### **Earthquake**

More than 90% of *earthquakes* are related to tectonic plates and are caused at their borders, what might lead to tsunamis and landslides. The risk in Europe is far from being uniform. Nevertheless, models indicate that the main seismic zones, expecting a 14 magnitude, are in the Mediterranean sea: Greece and Italy (Guerrieri, 2010:94-95). Simultaneously with the UK (belonging to the Baveridgean model) they present the highest number of people affected in all EU, in the decade of 2000-2010 (CRED: 2011). However, countries outside this region (Germany, Slovenia) though with a low seismicity rate, have triggered it in the two decades. It is stressed that in the 2000-2010 period the number of countries decreased 18% and that it was a natural risk that most affected people (1.994.117) in 1990-2000 (see table 2 in pp. 9).

### **Drought**

The years from 1990 to 1995, were a period in which the *drought* risk danger manifested itself critically, especially in Spain, where 6.000.000 people were affected. It represents in the last twenty years the risk that was the most present. Other member states were affected, although there was not any fatal loss or population inflictions. Notice that from one decade to another the number of countries running this risk decreased in 8%, yet Europe

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<sup>43</sup> Lammefjord (Denmark), Zuidplaspolder (Netherland), A Fens (UK), Neuendorf bei Wilster (Germany), Bay (Sweden), river Rhone's delta (France), Raczk Elblaskie (Poland).

experienced its hottest summer in 2003 (Tables 2 and 3). According to Demuth (2009:18) there was a generalized break in harvesting, forest fires, burnt landscapes and record temperatures. In 2006 and the following, the issue continued to exist. Heat waves and droughts comprised large areas of central, western and southern Europe. The drought and water resource shortage, a condition exacerbated by climate alterations, has put high pressure on the EU.

### **Epidemics**

Although in a smaller percentage, in relation to the disasters hereby explored, countries such as France, Romania and Spain were not able to respond to *epidemics* in 2000-2010. The fatal epidemics kind has increased. If in the first decade people would die from listeriosis (France) and legionellosis (Netherland), in the seconde decade they died from acute respiratory syndrome (Ireland, Italy, France), meningococcal disease serogroup W135 (UK) and legionellosis (Spain) (Medical Encyclopaedia: 2011; CRED:2011). Notice that in its majority, they have Beveridgean based health systems. If we look into to the number of affected people, it is possible to verify the same. There is a significant number of affected people (12.511) comparing it with the Bismarckian (712) and mixed (0) (see Table 3, on pp. 11).

### **Forest fires**

Regarding *forest fires*, they have always been an important concern of southern Europe, which recently continues presenting vulnerabilities. According to San-Miguel-Ayanz, and Camia, (2010: 47), about 70% of fires happen in this region, and they are responsible for 85% of the total burnt area in Europe. It's thought that climate change may increase the frequency of these conditions and release the fire season, both temporally and spatially. Bulgaria and Slovenia enlarge the number of countries that have developed this issue. It turned from 22% to 26% (see Table 2, in pp.9). Biodiversity destruction, desertification, air pollution, water resources implications, are some of its effects, in addition to human life and health damage. These affects tend to aggravate with climate change. In Greece, Portugal and Spain (Beveridgean models) in 2000-2010, 157.982 people were affected, on the contrary; France and Bulgaria (Bismarckian models) only 3.180 people, and in the Netherlands (mixed model) none, at any of the periods.

### **Technological accidents**

Finally, *technological accidents*<sup>44</sup>. Most states did not respond to it in both decades. Especially transport related accidents, whose fatal victims exceed all the other types, showing

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<sup>44</sup> Accidents involving transportation, industries and several others.

5954 fatalities over 217 (industrial accidents) and 922 (miscellaneous accidents) (CRED: 2011). These kinds of disasters are the ones which most caused fatal victims in the last two decades. The Beveridgean group states present the major number of affected people in 1990-2000; and the Bismarckian in 2000-2010. The industrial accident at Guadiamar river (Spain) in 1998, which affected 46.000 people, and the industrial explosion at the petrochemical plant AZF Toulouse (France) in 2001 which affected 17.442 people, have considerably contributed for this inversion (op.cit.).

### The results of the analysis and the health systems

The fact that the state members hold a natural and technological disaster risk reduction system; in addition to prevention and contingency plans supervised by the national civil protection sector, where the health sector is a collaborative<sup>45</sup> part, seem to have provided a significant decrease of affected population; either in natural or in technological disasters. However, they did not impede that the number of fatalities attributed to natural catastrophe, according to table 4, increase from 2.625 to 75.360.

**Table 4:** No Deaths and Affected in Natural and Technological Disasters, by European Health Funding Model in: 1990-2000 and 2000-2010

|                  | No of killed |           | No of total affected people |           | No of killed |           | No of total affected people |           |
|------------------|--------------|-----------|-----------------------------|-----------|--------------|-----------|-----------------------------|-----------|
|                  | 1990-2000    | 2000-2010 | 1990-2000                   | 2000-2010 | 1990-2000    | 2000-2010 | 1990-2000                   | 2000-2010 |
| <b>Beveridge</b> | 1075         | 39193     | 7515811                     | 734282    | 1755         | 1825      | 53307                       | 3235      |
| <b>Bismarck</b>  | 1527         | 36156     | 5247708                     | 936652    | 2003         | 1253      | 6584                        | 19726     |
| <b>Mixed</b>     | 23           | 11        | 265320                      | 1966      | 180          | 45        | 50                          | 3195      |
| <b>Total</b>     | 2625         | 75360     | 13028839                    | 1672900   | 3938         | 3123      | 59941                       | 26156     |

Source: EM-DAT: OFCA/CRED: 2011

Concerning natural disasters, countries included in the Beveridge group had the highest number of fatalities (38604) in 2000-2010, while the Bismarck group presented the highest number (3312) in 1990-2000. Concerning the number of affected people, all groups reduced the numbers considerably. However, in the first decade the Beveridge group had a

<sup>45</sup> According to Prevention Web: 2011 and : Arrêté Royal du 31.01.2003-Belguim; Rules No18 dated 23/1/1998-Burgary; Civil Defence Law of 1996 and Civil Defence Regulations of 1999-Chipre; Décret no. 95-1089 du 5/10/1995-France; Law 3013/2002-Greece; Law no. 225 of 24/2/1992-Italy; l'Arrêté Grand-ducal du 5/9/1960-Luxembourg; Civil Protection Act 1997-Malta; Lei n° 25/2006 of 31/7-Portugal; Governmental Ordinance no. 1/1999-Romania; Royal Decree N° 407 of 24/4/1992-Spain; Act 2004 Civil Contingencies-UK; Law no. 240/2000-Czech Rep.; Law no 660 of 10/6/2009-Denmark; Law -Hungary; Civil Defence Law of 5/10/ 2006-Latvia; Law no159-7207/2009-Lithuania; Act n°28/6 of 17/3/ 2006-Slovenia.

lower number of affected people (7.515.811), the same happened to Bismarck in the second decade (936.652).

Regarding technological disasters, data reveals that the industrial disaster at Guadiamar river (Spain) contributed to the Beveridgean group based health systems to show higher numbers than Bismarckian numbers during the first period. In 2000-2010, this group shows a higher number of affected people (19.726) than the one of countries comprised by the remaining models. On the other hand, standing out in the first cited model, Sweden, Finland, and Denmark, for the reduced number of fatalities and of affected population, though they perish as much as the remaining countries. There is some reservation to be made: Luxemburg, included in the Bismarckian model, has fatalities and affected people rates very similar to these countries.

The experience of prevention and preparation of these countries must be taken into consideration by the remaining countries. Summing up, according to Aven and Renn (2009:9) and Veyret (2007:26); what might be considered as a risk to a certain country, might not be to another, due to distinct scientific and organizational views, local experience, social conditions, geographical conditions or even policies. This assumption might corroborate these differences.

We may conclude, considering the number of affected people in natural and technological disasters that: **1)** the Beveridge based model was able to improve its responses while the Bismarck based model was not able to do as much, and that the mixed one only improved when related to natural disasters. **2)** comparatively, the first referred model is the one which best responds to crisis situations in its geographical space. **3)** the financial costs of damage for all types of disasters are higher in the two periods in the models that best respond to them: 2.727.972 and 12.008.301 million dollars respectively (see Table 3 on pp. 11).

Notice that the risks might represent specific problems for the planning and coordination of emergency actions. Partly because of the catastrophe scale. They might make pressure on emergency services, disable the ones involved in the operations, and mainly demand approaches for the complex logistic problems that are more innovative, as well as demanding for appropriate measures so as to limit the losses (OCDE, 2003:2-6). This conclusion must be adopted by all the other models.

Kofi Annan says that: “We should, above all, change from a reaction culture to a prevention culture. The humanitarian community performs a formidable work in the reaction to disasters. But the most important in a medium and long term is strengthening and enlarging

numbers and costs' reduction programs, firstly. The prevention is not only more human than the cure, it is also less expensive" (UN, 1999:295).

Still, in this millennium the participation of the EU in relation to health and European health systems, prevention, and mitigation of natural and technological risks, is confined essentially in the realms of epidemic prevention, polluted related diseases, road accidents and injuries, and extreme temperatures, as seen in chapter two (EC: 2011).

Relatively to the others, such as floods and storms, that affect the highest number of people in large parts of the member countries; and that might boost epidemic diseases such as: cholera, leptospirosis, type A hepatitis, salmonellosis, and typhoid fever, preventive initiatives are unknown. Notice that the upcoming of these pathologies is also caused by the effects that these accidents cause, such as: downfalls of houses and trees, contaminated water, destruction of crops, psychological damage caused by the death of a loved one, air contamination by toxic matter, among others. The effects are mitigated, but not the causes.

It is noticeable that Europe has been revealing an increasing tendency since 1980 when it comes to floods and storms, mainly due to the continuous increment of meteorological and water related events (Wehrli and André, 2010:25).

Knowing the member states and the EU itself, the reality of these numbers, consummate for instance with the documents: Decision 2007/779/CE (EC, 2007c), Decision 2007/162/CE (EC: 2007d) and the Commission's Communication to the European Parliament to the Council "on Reinforcing the Union's Disaster Response Capacity" (EC:2008b) and "Community approach for the natural or caused by man catastrophe" (European Communities Commission: 2009), the health sector should be strongly included in this proposed preventive raising awareness action. Minding that doctors are professionals that have high levels of trust in Europe, with 83% of preference (Público: 2008); this might be an important index to an effective preventive practice awareness raising. The mitigation of these disasters is also a public health concern.

## **Conclusion**

The tumultuous economic and financial crisis that Europe and the rest of the world faces, has had a deep confluence in all sectors, and namely in the EU health sector. To balance public expenses with the guaranteed universal and free access needs is a difficult task. The EU 27 demographic aging, the increase and development of chronic diseases boosted by the new European lifestyles, reveals itself as a strong index of public expenditure. It adds to costs of large damage that comes with natural and technological disasters, being



them social, environmental and economic. Notice that the countries signatories of the health financing models Bevedrige, Bismarck and Mixed, increased spending on the damage of disasters, from one decade to another. Spent 6.345.212 million dollars to 12.061.047. The best solution to disasters (Bevedrige), cost 12.008.301 million dollars, in 2000-2010.

Consider for instance the elevated costs of: increasing the number of beds in hospitals to accommodate catastrophe victims, the costs of hiring extra healthcare services to the victims, the costs of awareness raising campaigns for new diseases and epidemics triggered by the disaster. Corroborating what has been analyzed in this paper, The UN (1999) considers disasters such as floods and storms the most expensive in financial and economic terms. They are the ones which most affect the European population.

The responses given by the health systems and by the Environmental, Health and Consumer Commission itself, fall into the emergency services and in medicine specialty of catastrophe and emergency, or some similar to this. They comprise essentially help providing to the victims in locus or in the hospitals, not in the providing of prevention services. Regarding prevention, the EU action is basically works with epidemics, pollution related diseases, road accidents and injury and the emergent extreme temperatures. These actions leave out the previously mentioned disasters. They are a responsibility of the public health. The European health systems mitigate their effects, not their causes. The effect of the causes may defuse diseases and nefarious epidemics, increasing then the health expenses. More importantly, we can't, forget that there is the probability of climate change, increase the intensity and frequency of floods, storms and other natural hazards.

On the other hand, the negative happenings such as the recent nuclear crisis in Japan, should serve the member states as a warning to prevent this kind of problematic in the European space.

According to the Portuguese magazine "Sábado" (2011), in March 21<sup>st</sup> 2011, the EU 27, decided to conduct resistance test to the nuclear centers in the community space, in the occasion of earthquakes, and terrorism; to prevent similar events. This kind of initiatives was inserted in the Energy and Natural Resources Commission realm. The same magazine (2011) indicates that in the following week a new top level conference will be held, where state members' representatives, vigilance authorities' representatives and atomic energy companies' representatives will be participating; to proceed with the discussion of the resistance test criteria. It must be asked why since this moment the health system participation is not included.

Furthermore, in a globalized world, very far from the old societies where risks were faced with mystical and/or religious outlines, science and technical development create the uncertainty in which we live, is a prevention mechanism (Cunha, 2010:2). That is, today's possibility to know in real time the occurrence of disasters in various parts of the planet, and the capacity to foresee may be used for member states' prevention and preparation. Especially the ones comprised by Bismarck's model, which do not respond as effectively to disasters as the remaining ones. Notice for instance that disaster reduction support mechanisms, such as the Global Disaster Alert and Coordination System do Office for the Coordination of Humanitarian Affairs of the United Nations (OCHA) (GDACS: 2011), allowed me, for example on March 26<sup>th</sup> 2011 about 12:05:20 UTC, to observe the occurrence in the EU 27 space, of earthquakes with 2.4 magnitude at Velvinia (Greece) (HISZ, RSOE: 2011).

For all this, the EU must: **1)** transform the health sector into a community policy and create an independent Commission from the Environment and Consumer one; **2)** include natural risks, especially floods and storms in the prevention actions of the health systems of each country and of the health area Commission; **3)** invest in the development of predicting and monitoring risk systems and population warning systems; **4)** have special attention to the risk mitigation plans in Sweden, Finland, Denmark and Luxemburg, followed by the remaining countries.

These aspects represent political and economic issues, which must be seen as a financial investment to the sustainability of Europe and of the forthcoming generations.

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